STATEMENT OF NICHOLAS A. SABATINI, ASSOCIATE ADMINISTRATOR FOR AVIATION SAFETY, FEDERAL AVIATION ADMINISTRATION, BEFORE THE SUBCOMMITTEE ON AVIATION, COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE, U.S. HOUSE OF REPRESENTATIVES, ON RECENT LASER INCIDENTS AND THE POTENTIAL IMPACT ON AVIATION SAFETY

MARCH 15, 2005

Chairman Mica, Congressman Costello, and Members of the Subcommittee,

Good morning, it is a pleasure to be here today as the Subcommittee on Aviation explores an important issue for aviation safety—the focusing of lasers on cockpits of aircraft and helicopters. I am Nick Sabatini, Associate Administrator for Aviation Safety at the Federal Aviation Administration (FAA), and this morning, I would like to provide an overview of how hand-held lasers are regulated, the potential of catastrophic events from the irradiation of a cockpit, and what the FAA is doing to protect air crew members from these incidents.

With me today is Dr. Van Nakagawara, a Research Optometrist and Vision Research Team Leader at the FAA's Civil Aerospace Medical Institute, popularly known as CAMI. Dr. Nakagawara is the lead author of a study entitled, "The Effects of Laser Illumination on Operational and Visual Performance of Pilots During Final Approach," which was published in June 2004.

In recent years, LASER (Light Amplification by Stimulated Emission of Radiation) devices have become less expensive and more commonplace. Lasers are used in supermarket scanners, CD and DVD players, construction and surveying instruments, laser pointers for presentations, and for other medical and industrial purposes. Also, lasers are often used outdoors as part of orchestrated laser light shows at theme parks, casinos, and special events.

The issue of how lasers affect pilots and whether they pose a threat to aviation safety has received media attention recently. The aviation safety issue is very straightforward. Obviously, pilots use their eyes to obtain the vast majority (approximately 80%) of all the information needed to safely fly an aircraft. Operation of an aircraft at night presents additional visual challenges. Exposure to relatively bright light such as a laser, when the eye is adapted to low-light levels, can result in temporary visual impairment. Visual effects can last from several seconds to several minutes. The three most common physiological effects associated with exposure to bright lights are: 1) glare, 2) flash-blindness, and 3) afterimage.

The principal concern for pilots is the possibility of being illuminated with a laser during terminal operations, which include approach, landing and take-off. Pilots conducting

low-altitude operations at night are particularly vulnerable to accidental or malicious laser illumination.

Let me state at the outset that, to date, no accidents have been attributed to the illumination of air crew members by lasers. While a few of these incidents have resulted in reported eye injury, no civilian pilot has had any permanent visual impairment as a result of laser exposure. However, given the considerable number of reported laser incidents—over 400 since 1990—and approximately 112 incidents since November 2004, the potential for an aviation accident does exist.

I want to emphasize that the Department of Homeland Security (DHS) assures us that they have no information that would suggest that any of these incidents is in any way related to terrorist activity. Some incidents have made national news. One such incident occurred in December when a father and daughter allegedly were experimenting with a new laser pointer to test its capabilities. The man allegedly pointed it at an aircraft on its final approach, and then, two days later, at a helicopter. The helicopter was operated by the Port Authority of New York and New Jersey Police Department, who were searching for the suspect in the earlier laser incident, when it was illuminated. The helicopter was able to identify the location based on the earlier complaint, and the man was arrested.

FAA's role in the issues surrounding the use of lasers rests with our mandate to ensure aviation safety. There are other entities who are investigating this issue from a security perspective, and it is important for everyone to understand the various roles and responsibilities. The FAA has no authority to either regulate lasers or take enforcement action against individuals who illuminate aircraft cockpits. The Food and Drug Administration (FDA) has authority to regulate light-emitting products and electronic product radiation. With respect to the enforcement issue, federal, state and local law enforcement entities have the authority to prosecute individuals who recklessly illuminate aircraft cockpits. Certainly, FAA has an important role in working with these entities to ensure aviation safety, but our role is not a primary one.

The FDA regulates lasers under their "Performance Standards for Light-Emitting Products." This FDA standard utilizes the American National Standard Institute (ANSI Z136.1) recommended Maximum Permissible Exposure (MPE) of 2.5 milliwatts per centimeter squared for continuous wave lasers, which is applied to the previously established Normal Flight Zone to prevent ocular tissue damage in all navigable airspace. The MPE is used to calculate the Nominal Ocular Hazard Distance (NOHD), which is the distance of a laser beam beyond which an individual may be exposed without risk of ocular tissue damage.

Based in part on historical laser safety data and military research on vision performance loss from laser exposure, the FAA issued a revised FAA Order 7400.2 on December 31, 2002, which includes new guidelines for Flight Safe Exposure Limits (FSELs) in specific zones of navigable airspace associated with airport terminal operations. The revised FAA Order 7400.2 establishes four specific zones: 1) the Laser Free Flight Zone; 2) the Critical Flight Zone; 3) the Sensitive Flight Zone; and 4) the Normal Flight Zone. The

Laser Free Flight Zone includes airspace in the immediate proximity of the airport, up to and including 2,000 feet above ground level, extending two nautical miles in all directions measured from the runway centerline. The Critical Flight Zone includes the space outside the Laser Free Flight Zone to a distance of 10 nautical miles from the Airport Reference Point to 10,000 feet above ground level. Virtually all of the lasing incidents to date have occurred in the Critical Flight Zone. The parameters of the Sensitive Flight Zone include airspace outside the critical flight zones that authorities (e.g., FAA, local departments of aviation, military) have identified that must be protected from the potential effects of laser emissions. The Normal Flight Zone includes all navigable airspace not defined by the Laser Free, Critical, or Sensitive Flight Zones.

The necessity of establishing Laser Free Zones around airports is documented in the results of a study done by CAMI and published in June 2004. The study consisted of subjecting 34 pilots to four eye-safe levels of visible laser light during four final approach maneuvers in a flight simulator. All test subjects were volunteers who participated after giving informed consent. Subjective responses were solicited after each trial and during an exit interview, and the pilots were asked to rate the affect the laser exposure had on their ability to operate the aircraft and on their visual performance.

Approximately 75 percent of the responses solicited from subjects indicated they had experienced adverse visual effects resulting in some degree of operational difficulty when illuminated by laser radiation during final approach maneuvers at or below 100 feet above ground level. Even at the lowest level of laser exposure, two-thirds of the responses indicated that the subjects experienced glare, flash-blindness, or afterimages. However, it is important to note that all subjects were able to maintain operational control, and safely land the plane or successfully execute a missed approach. Significantly, none of the actual lasing incidents against aircraft to date have occurred within these parameters.

In response to the recent increase in reports of pilots being illuminated with lasers, and as a result of the findings in the CAMI report, Secretary Mineta announced on January 12, 2005, a new FAA policy designed to protect air crews and passengers, and to discourage future laser incidents. Secretary Mineta directed the FAA to distribute an Advisory Circular, AC 70-02, which contains new guidelines to give pilots, air traffic controllers, and law enforcement timely information about laser incidents. The new guidelines will help pilots identify areas where lasers have been sighted; will assist controllers in reporting laser incidents; and will give law enforcement officers the information as quickly as possible in order to investigate and prosecute those persons who put aircraft at risk.

As of January 19, 2005, all pilots are now requested to immediately report any laser sightings to air traffic controllers, who will then be required to share these reports through the Federal Domestic Events Network. Once these laser incidents are posted on the network, air traffic controllers will work with law enforcement entities to identify the source of the lasers, with the goal of assisting police in locating the scene of the lasing incident swiftly, and hopefully, apprehending the person responsible. As Secretary

Mineta said when announcing this new policy, "We must act now, before someone's reckless actions lead to a terrible and tragic incident."

At the present time, there is no system or device that can be installed on aircraft or given to pilots and crew to protect them from these incidents without possibly affecting operational performance. The U.S. Military has dedicated a great deal of time and research to finding ways of protecting their pilots from an enemy's use of lasers to impair pilot performance during military flight operations. Their efforts have established that there is no easy answer to this problem. For example, efforts to develop pilot goggles that will screen out all the wavelengths of visible lasers, and thereby prevent any adverse affects from exposure to them, have proven to have limited practical application and may even be potentially hazardous to flight safety. Screening out the wavelengths that produce red and green light (the most common colors of lasers) would also impair the pilot's ability to read the instruments in current cockpits, which are often displayed in either green or magenta. The goggles can also impair the pilot's vision by reducing the amount of visible light. Both of these results are unacceptable. Consequently, other initiatives that call for installing filters or screens on cockpit windscreens to intercept or deflect lasers could similarly result in an unacceptable reduction of critical visibility for safe flight. Protecting pilots from the real, but remote, risk of being illuminated by a commercially available laser powerful enough to cause an accident cannot be accomplished by a solution that could create an even more dangerous operating condition. We at the FAA are working with the Department of Defense to explore technologies and protocols that may provide protection for pilots and air crews, while not impairing their ability to safely operate their aircraft.

An alternative solution may be an operational one. We are hopeful that by obtaining and evaluating more information on the affects and risks of laser illumination, FAA might, at some point, be in a position to develop protocols for pilots to follow to best mitigate the affects of a laser, much as we have for other operational challenges. Examples of these protocols for flight crews include: shielding their eyes to the maximum extent possible, yet consistent with aircraft control and safety; avoiding flight within areas of reported on-going unauthorized laser activity; and avoiding areas, if practicable, where an incident has just been reported and a warning broadcasted. Other measures could include obtaining authorization to deviate from the last assigned clearance in the event laser activity is encountered, and expediting the reporting of incidents to the appropriate air traffic control facility.

In the interim, the FAA will continue to partner with the Department of Homeland Security to better define the threat posed by laser devices and identify countermeasures to minimize the risk to aviation safety. We will also work collaboratively with Department of Defense scientists to determine whether any of their research could have practical applications to the civil aviation arena. It is our hope that the Advisory Circular the Secretary announced earlier this year will result in an improvement in the ability of state and local government to prosecute individuals who intentionally attempt to focus lasers on aircraft. Aggressive enforcement will hopefully discourage reckless laser use. The FAA will also continue working with the FDA and the Consumer Product Safety

Commission to improve product labeling and better educate the general public concerning the potential harm from the inappropriate use of lasers. Improved labels and better education represent the best means of raising awareness among the public in the short term.

Mr. Chairman, this concludes my testimony, and I would be happy to answer any questions you may have.